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factory conclusions can be deduced from the data at hand. The apparently limited distribution of the fungus may merely indicate a scarcity of collections. A table indicating distribution of the species shows in general that the teleutospore generation is more restricted as to its hosts than the aecidial generation. Only 4 genera (5 if the two sections of *Juniperus* are considered as genera) serve for hosts of teleutospores, while 15 genera serve as aecidial hosts, *Crataegus* and *Amelanchier* being in the lead among these. While the aecidial generation has always been regarded as confined to the *Pomeae*, the work of recent years has shown that one form has aecidia on *Gillenia* (*Porteranthus*) of the Spiraeeae, and another on *Fendlera* and *Philadelphus* of the Saxifragaceae, while *G. bermudianum* is autoecious.

Part II comprises the systematic treatment of the genus, 40 species being recognized and described, the descriptions being in most cases accompanied by figures of spores or peridial cells showing characteristic features. Of the 40 species known in the world, 29 are known in their complete life cycle, 7 are known only in their aecidial phase, and 4 only in their telial phase. *Gymnosporangium fraternum*, *G. juvenescens*, and *G. effusum* are described as new, and the aecidial hosts of three species are reported for the first time. The taxonomic treatment is preceded by two sets of keys based respectively on the characteristics of the fungus and on those of the hosts. Most of the species are admirably illustrated by halftone plates.—H. HASSELBRING.

Inheritance of root-form and color in beets and turnips.—The large number of varieties of beets and turnips characterized by distinctive forms and colors of the roots has long invited the attention of experimental breeders, but the very abundance of material has doubtless acted as a deterrent to genetic investigation. KAJANUS[13] has undertaken the difficult task of analysis. As a first approximation to a complete solution of hereditary form-relations in beets, he finds the probable existence of six independent genes affecting the form, namely, two genes (L_1 and L_2) which produce an elongation of the roots, two (A_1 and A_2) which cause the roots to be taper-pointed below, an inhibitor (B) which opposes the action of the elongation-genes, and another (O) which opposes the action of the taper-point genes. When B and O are not present, the long and tapered forms are epistatic over the short and blunt forms, but when these inhibitors are present, the apparent dominance is reversed. The evidence for the existence of these genes consists at present wholly in the occurrence of the ratios 3:1, 15:1, and 1:3 in the F_2. In most of the reported crosses the results run fairly close to these ratios, but when so many determiners affect the same character, the F_2 ratios are only suggestive and not decisive. Until a third and perhaps still later generations have been grown, the assumptions made by the author remain hypothetical, but with the weight of the observed F_2 ratios in their favor. In the Brassicas studied, the situation appears to be much simpler. In the turnip-rooted cabbages or Swedes (*B. Napus*) the roots are always approximately globular, but in the turnips (*B. Rapa*) both globular and elongated forms occur and there appear to be, just as in beets, two elongation genes (L_1 and L_2). Here again the evidence for these two genes is the appearance of the long and round forms in the F_2 in the ratio 15:1, and a later generation must decide the correctness of the interpretation.

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[13] KAJANUS, B., Genetische Studien an *Beta*. Zeitschr. Ind. Abst. Vererb. **6:**137–179. *pls. 9. figs. 2.* 1911.

———, Mendelistische Studien an Rüben. Fühlings Landwirthsch. Zeitg. **61:**142–149. 1912.

———, Genetische Studien an *Brassica*. Zeitschr. Ind. Abst. Vererb. **6:**217–237. *pls. 4.* 1912.

In regard to the color of the roots the situation is also quite complex, perhaps even more so than in respect to form. Red is in some cases dominant to its absence, in other cases recessive (owing probably to the presence of an inhibitor), and it may appear in crosses between two whites, white and yellow, rose and yellow, etc., showing its compound nature. Some of the color-ratios are approximately 15:1 and others 3:1, which are also interpreted as indicating the existence of more than one gene capable of producing independently the same color-character. In turnips the upper portion of the roots is red, green, or yellow, each of these colors being epistatic to those following. The lower portion of the roots is white or yellow, having the same color as the flesh, the white being epistatic to yellow. In the turnip-rooted cabbages the heads are either violet-red or green. There are two independent genes which produce violet-red pigmentation, the one giving a light red, the other a dark red. As the latter is completely epistatic over the lighter color, a cross in which both of these genes and their absence are involved, produces an F_2 progeny consisting of dark red, light red, and white, in the ratio 12:3:1. Both in form and color the heterozygotes are often intermediate, so that a more or less completely continuous series of forms is produced, thus making the analysis difficult. This fact makes very important the promised continuation of the work.—GEO. H. SHULL.

Inheritance in wheat.—NILSSON-EHLE[14] gives a further report on his long-continued experiments in the crossing of wheat varieties, dealing this time especially with the density of the spikes and resistance to yellow rust (*Puccinia glumarum*). Both of these characters are lacking in the definiteness which has made the study of many alternative characters easy and the results clear-cut and decisive, but the author's earlier demonstration of several independent genes producing the same apparent character in seed-color of wheat and in the awns of oats has given a key to these more difficult cases. The density of the spikes is apparently modified by three distinct genes, two of which (L_1 and L_2)

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[14] NILSSON-EHLE, H., Kreuzungsuntersuchungen an Hafer und Weizen. II. Lunds Universitets Årsskrift. 7:no. 6. pp. 84. 1911.